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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - MAY 1978

RESEARCH HIGHLIGHTS

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LA JOLLA, CALIFORNIA

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PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - MAY 1978

STATUS OF PUBLICATIONS

Published

Eldridge, M.G., T. Echeverria, and S. Korn. Fate of ^{14}C -benzene in eggs and larvae of Pacific herring (Clupea harengus pallasi). J. Fish. Res. Board Can. 35:861-865.

Eggs and larvae of Pacific herring demonstrated food web magnification of petroleum-based hydrocarbons by accumulating the ^{14}C -labeled chemical benzene. All early life stages took up benzene in their tissues from water to maximum levels within 6 to 12 h, in direct proportion to the original exposure concentrations. The degree of magnification was inversely related to age--the younger the life stage, the greater the accumulation. Feeding larvae showed that tissues absorbed benzene first from the water, then later from food. Reasons for differences in total accumulation and uptake rates are discussed.

Fox, William W., Jr. 1978. Tuna/dolphin program. Oceans 3:57-59.

Approved by Center Director

Alvarinō, Angeles and John R. Hunter. New records of Alloposus mollis Verrill (Cephalopoda, Octopoda) from the Pacific Ocean. For publication in Veliger.

Hobson, E.S. and J.R. Chess. Zooplankers that emerge from the lagoon floor at night at Kure and Midway Atolls, Hawaii. Submitted to Fishery Bulletin.

Miller, Forrest R. and Richard H. Evans. The ocean environment of the eastern tropical Pacific as related to tuna purse seining. For publication in Fishery Bulletin, U.S.

This report does not constitute publication and is for information only.

Translations

Suisan Sekai. 1977. Management of the Tosa (Kochi) skipjack tuna fishery (Ju-nen de shinto shita mizuage kin no shuchu kanri hoshiki). Suisan Sekai 26(8):24-28. (Translation from Japanese by Tamio Otsu of selected parts of article, 1978, 7 p., Translation No. 29.)

Suisan Sekai. 1978. The activities of the billfish drift-net vessels (Ome nagashi bune no ido wa 395-seki). Suisan Sekai 27(2):56-58. (Translated from Japanese by Tamio Otsu, 1978, 5 p., Translation No. 28.)

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Work Continues on Fishery Management Plans

Researchers in the Fishery Management Research Task continued working on a variety of assignments related to the development of a management plan for billfishes and other pelagic species in the central and western Pacific Ocean. Dr. Michael Adams, Industry Economist at the Honolulu Laboratory, assisted by James Cooper, Research Assistant, continued his analysis of the value of commercial and recreational billfishing in Hawaii. The results of his study will contribute to an analysis of alternative management policies for control of billfish harvests within the 200-mile Fishery Conservation Zone (FCZ). The policy analysis is being conducted by Dr. Roy Mendelsohn, Operations Research Analyst, who is also responsible for synthesizing background material on the biology, economics, and management of billfishes and other pelagic species and preparing a draft Fishery Management Plan. Contributing to the background material for the plan were Dr. Jerry Wetherall, Leader of the Task, Howard Yoshida, Fishery Biologist, Marian Yong, Mathematician, and Heeny Yuen, Recreational Fisheries Task Leader. Yong is collaborating with Wetherall in preparing a comprehensive summary of the catch of tunas and billfishes and associated effort by foreign fishing fleets within the FCZ around Hawaii, American Samoa, Guam, and other U.S. island territories in the Pacific. The catch summary includes data for the Northern Mariana Islands and the Trust Territory of the Pacific Islands.

Increased Catches Around Aggregating Devices Reported

Walter M. Matsumoto, Fishery Biologist at the Honolulu Laboratory, noted that increased catches of tunas have been reported from around the aggregating objects during May. As of May 27, 396,500 lb of skipjack and small yellowfin tunas were reported taken from around the aggregating devices on 63 visits by commercial fishing vessels. The catch was 45.5%

of the total tuna landed at the local tuna cannery for the same period and was made on 39% of the days fished. The catches were made mostly at buoys A (181,700 lb) and D (210,500 lb). The average catch per visit was 8,260 lb at A and 9,570 lb at D. These averages are sharply higher than the long-term second quarter averages of 4,774 and 4,664 lb for the two buoys, respectively.

In response to the increased interest in the aggregating devices, a draft of a "Master" plan to expand the fish aggregating devices program was developed and presented at a meeting of selected members of the State Legislature, State and Federal officials, and representatives of recreational and commercial fishing interests. There was general agreement among participants that the aggregation devices have been extremely successful and that the State should support an expanded program.

Results of Study on Size Composition of Hawaiian Skipjack Tuna Reported at Tuna Conference

Fletcher Riggs, Fishery Biologist, reported on the results of a study on skipjack tuna entitled, "Skipjack tuna size composition in the Hawaiian pole-and-line fishery," at the 29th Tuna Conference held at Lake Arrowhead, California, from May 22-24. The report consists of a presentation of basic descriptive statistics on skipjack tuna and a description of progress to date in the examination of changes in these statistics over time. Included in the report were analyses to determine (1) long-term trends in size over the 32-period in which data were collected, (2) variations in size among years and quarters, and (3) variations among quarters that were not consistent from year to year. The report also describes plans for further analyses to determine if observed variations represent complex changes within a single stock or if some of the observed variations represent changing combinations of two or more stocks.

Spiny Lobster Growth Parameters Determined

James Uchiyama, Fishery Biologist at the Honolulu Laboratory, assisted by Gary Kamer, Statistician, and Robert Humphreys, Research Assistant, analyzed size-frequency distributions of spiny lobster, Panulirus marginatus, using the computer program ENORMSEP. Four modes were identified in the male distributions and only one mode could be distinguished in the female distributions. Of the four modes in the male distributions, only two of the smaller modes tended to decrease with time. Mr. Uchiyama concluded that these results reflect the effects of fishing pressure on the spiny lobster stock at Necker Island where the samples were obtained. Using the von Bertalanffy growth model the following growth parameters were determined for male spiny lobsters: $L_{\infty} = 10.64$ cm, carapace length, and $K = 0.5764$.

Townsend Cromwell Departs on Cruise
To Western Pacific

The NOAA ship, Townsend Cromwell, departed Honolulu May 9 on cruise 78-02 (TC-79) to waters around Guam and the Northern Mariana Islands to survey and assess the demersal and pelagic fishery resources over sea-mounts, banks, reefs, and offshore waters of the area. The cruise objectives will be accomplished by fishing operations using fish and shrimp trawls, handline, lobster pots, shrimp pots, and fish traps for fish, shrimp, crab, squid, and lobster to determine their availability, catchability, distribution, and relative abundance.

Scientists from the University of Guam, University of Hawaii, and various governmental agencies of Guam and the Northern Mariana Islands will be participating in various segments of the cruise. Richard Uchida, Leader, Insular Resources Task, will be Chief Scientist on the cruise during the period May 30-July 4; Paul Shiota, Research Assistant, will be Acting Chief Scientist from May 9 to 29 and Robert Moffitt, Research Assistant, from July 5 to 18.

* * * * *

Tamio Otsu, Chief, RADI, met with Doyle Gates and Robert Iversen, Western Pacific Program Office, SWR, to discuss communication with Honolulu Laboratory's fishery observer, Mr. Thomas Kazama, on the Japanese trawler fishing on the Hancock Seamount. Otsu also provided information for a story on the aggregation project to Helen Altonn, a newspaper reporter on the staff of the Honolulu Star Bulletin. The story appeared in the May 15 edition of the Star Bulletin.

Personnel in the Insular Resources Task continued work processing data and biological material collected on cruises to the Northwestern Hawaiian Islands (NWHI). Darryl Tagami, Research Assistant, determined fork-standard length and length-weight relationships for various commercially important bottomfishes sampled in NWHI waters. The following length-weight relationships for species sampled on Townsend Cromwell cruise 77-03 were computed:

$$\text{Epinephelus quernus}, W = 4.654 \times 10^{-5} L^{2.967}$$

$$\text{Etelis marshi}, W = 3.579 \times 10^{-5} L^{2.924}; \text{ and}$$

$$\text{Pristipomoides microlepis}, W = 2.507 \times 10^{-5} L^{2.9988},$$

where W is weight in kilograms and L is standard length in centimeters.

Victor Honda computed handline catch rates for snappers, groupers, and carangids by 6 min square areas around several islands and atolls in the NWHI and plotted the catch rates to determine areal differences

in relative abundance for these species. To fulfill a request from the Smithsonian Institution, he compiled historical midwater trawl data from cruises of the research vessels Hugh M. Smith, John R. Manning, Charles H. Gilbert, and Townsend Cromwell in the Honolulu Laboratory files. Mr. Honda also identified an unusual jelly-like octopus, Alloposus mollis, which was caught on Townsend Cromwell cruise 78-01. Dr. Richard Young of the University of Hawaii aided in identifying the specimen.

Glenn Higashi, Research Assistant, searched the literature for methods of analyzing stomach contents and evaluating maturity and fecundity of pelagic, mesopelagic, and demersal fishes in preparation for similar studies on fishes collected in the NWHI. He also prepared a data form for keypunching the anticipated stomach analysis data and also procured the necessary laboratory equipment for the study.

Thomas Hida, Fishery Biologist, worked on the narrative report for Townsend Cromwell cruise 78-01 (TC-78) (parts II and III). He also identified samples of baitfish from Ponape for the Marine Resources Division, Western Caroline Islands.

Jose Enitan and Jeffrey Sampaga, Research Assistants, read otoliths of pink snappers, Pristipomoides microlepis; pig ulua, Caranx cheilio; and pompano dolphin, Coryphaena equiselis, caught in NWHI waters.

Research Assistant Brian Joyo, under the supervision of Dr. Y. Hokama, John A. Burns School of Medicine, University of Hawaii, completed 190 radioimmunoassay tests for ciguatoxin on flesh and gonad samples from a large variety of bottom and pelagic fishes caught in the NWHI.

* * * * *

Uchida continued work on the draft FMP for the Seamount Groundfish Resources and also reviewed the University of Hawaii Sea Grant research proposals related to studies of the NWHI marine fauna. He discussed with Dr. Richard Grigg, UH Sea Grant Office, the progress made by the Insular Resources Task in research on spiny lobsters, snappers, groupers, carangids, other groundfish, and plankton.

Estimated Skipjack Tuna Landings Through May Continue Above Long-Term Average

The May 1978 Hawaii landings of skipjack tuna were estimated at 445 metric tons (MT), which is 127 MT above the landings for the same period in 1977 and 40 MT below the 1948-77 long-term average for the same period. The cumulative landings from January through May were estimated at 1,221 MT, which is 288 MT below last year's landings for the same period and 137 MT above the 1948-77 long-term average for the same period.

FISH-ENVIRONMENT INVESTIGATIONS

Preparations Made for Yellowfin Tuna Tracking Cruise

Heeny Yuen, Leader, Recreational Fisheries Task at the Honolulu Laboratory, made preparations for a 5-day cruise from June 14 to 19 to track yellowfin tuna off the Waianae coast of Oahu, Hawaii. The cruise objective is to collect data on movement patterns and energy requirements of yellowfin tuna. The Hawaiian Invitational Allison Tuna Tournament organization is underwriting part of the experiment by chartering the vessel for Yuen's use. In addition to Yuen, Dr. Andrew Dizon, Leader, Experimental Ecology of Tunas Task, and Richard Brill, University of Hawaii graduate student, will be participating in the cruise.

* * * * *

Mr. Yuen wrote an article on tracking yellowfin tuna for the official program of the Hawaiian Invitational Allison Tuna Tournament of 1978. The program will be distributed to participants in the tournament which is scheduled for mid-July. He also participated in a seminar on creel census sponsored by the Hawaii Division of Fish and Game and presented a lecture on recreational fishing to a class on sportfishing in the School of Continuing Education, University of Hawaii.

* * * * *

Alana McKinney, one of Honolulu Laboratory's sources of information on sportfishing on the Waianae coast, called Yuen to report that small blue marlin (50 lb and larger) were being caught in that area. She agreed to obtain length measurements and otolith samples for Honolulu Laboratory.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES PROGRAM

Oceanographic Conditions May Adversely Affect Albacore Fishing Success in 1978

According to Dr. M. Laurs, Leader of the Albacore Fisheries Program at the La Jolla Laboratory, a number of conditions exist that could unfavorably affect the availability of albacore off the Pacific west coast and lower fishing success in 1978. Laurs and his staff anticipate that most of the U.S. albacore catch during the 1978 fishing season will be

taken off central and southern California and southward to Guadalupe Island. Estimates are that approximately 75% of the catch will be taken in waters south of San Francisco and 25% in waters to the north.

Albacore are expected to be available earlier than normal this season in waters off southern California and southward to about Guadalupe Island. It appears that at least a portion of the "southern" group of albacore that form the U.S. fishery in waters south of about San Francisco did not migrate into central Pacific waters, but spent the winter months in waters relatively close to central-southern Baja California. These fish could be available in waters off San Diego-northern Baja California by mid-June. The early availability of fish could contribute to a high seasonal catch from this area; however, there are two oceanographic conditions that, if they persist, could limit the overall fishing success. First, coastal upwelling has been unusually weak along much of the Pacific coast this year. The lack of upwelling can result: a) in less nutrient enrichment of near-surface ocean waters and consequently fewer food animals for albacore, and b) in weak temperature fronts or "edges" where albacore often aggregate and which can be very important in albacore fishing. If upwelling remains weak, albacore could be relatively scattered and fishing spotty. A second oceanographic condition that could limit fishing success in waters off southern California and Baja California is unusually warm ocean temperatures. Sea surface temperatures in coastal waters off Baja California and southern California have been about 2° to 4°F (1.1 to 2.2°C) warmer than average during winter and spring months. If seasonal warming is not retarded, sea surface temperatures could exceed the 68°F (20°C) upper limit of the optimal temperature preference of albacore by about September. This could cause the fish to move into deeper, cooler waters and be less vulnerable to fishing gear or to move out of the area.

Temperature fronts or "edges" which are important in albacore fishing are also apparently poorly developed this year in many of the areas off central and northern California, except off Cape Mendocino, and off the Pacific Northwest as a result of weak coastal upwelling. If these conditions persist, fishing success could be hindered along much of the west coast of the U.S. Fortunately, however, strong coastal upwelling can be established in response to a few days of brisk northerly winds, and if the winds persist, well-developed temperature boundaries should be formed.

* * * * *

The catch of albacore from waters off the Pacific Northwest is expected to be limited this year. The major reason for this is an anticipated late arrival of the "northern" group of albacore that enter the U.S. fishery north of about San Francisco. Results from albacore research studies in recent years indicate that the group of fish which enter the U.S. fishery off the Pacific Northwest is separate from the group that enters the fishery south of about San Francisco and that the two groups of fish follow different migratory patterns. The "northern" group makes

trans-Pacific migrations between the eastern North Pacific and the western North Pacific where they are also fished on by the Japanese albacore fisheries. The "southern" group does not migrate to and from the western Pacific, but probably migrates to the central Pacific, perhaps to the longitudes of the Hawaiian Islands. The Japanese live bait fishery for albacore was late in starting and slow in developing this year, apparently in response to variations in oceanographic conditions in the western Pacific. This suggests that at least part of the "northern" group of albacore were late in leaving the western Pacific this year for their migration to waters off the Pacific Northwest. It is not possible to predict how much of the "northern" group will arrive in the eastern Pacific to be available to the U.S. fishery; however, there is a good possibility that a large portion of the fish will not have time to make the migration before ocean waters in the Pacific Northwest cool below the optimal temperature preference for albacore.

* * * * *

Three U.S. jigboats, which sailed from San Diego (one vessel) in early May to conduct albacore exploratory fishing/research studies across the North Pacific and into the western Pacific, made their first substantial catches of albacore (approximately 200 or more fish per day) during the last couple days in May from a body of fish near 35°N, 175°W. If this body of fish, which presumably is migrating to the eastern Pacific, continues to migrate and enters waters off the Pacific Northwest, it should arrive there near mid-August.

NMFS Albacore Advisories to be Issued Throughout 1978 Fishing Season

Dr. M. Laurs, Leader of the Albacore Fisheries Program at the La Jolla Laboratory, announced that albacore advisory information will continue to be issued throughout the 1978 season. This is the 16th consecutive year that the advisories have been issued by the La Jolla group. The advisory information will include sea surface temperature charts, narrative albacore fish bulletins, and daily broadcasts of albacore fishing information over marine and commercial radio bands.

The albacore fish bulletins will be issued twice each month during the season in conjunction with 15-day sea surface temperature charts which cover the area roughly between central Baja California and Vancouver Island out to 135°W. The bulletins will include short-term projection of albacore fishing conditions and other information as is appropriate. The NMFS fishery advisory materials are mailed upon request.

Daily broadcasts of albacore fishing information will also be prepared by the La Jolla Laboratory and will be transmitted over marine and commercial bands again this year. The broadcasts will be made twice daily on weekdays and once on Saturday mornings from July 10 through October 31, or until the albacore season ends. The broadcasts will include the latest albacore fishing information obtained from research vessels,

cooperating fishing vessels, unloading station operators and other sources. Highlights will include location of active centers of fishing, typical fishing scores, size of fish, sea surface temperature and subsurface temperature information when available, and other information as appropriate. San Diego sport boat albacore fishing activity will also be included. A weather and sea state summary prepared by the National Weather Service will also be given including large-scale weather features, regional wind, weather and sea state conditions between 20-250 miles offshore and storm development. NMFS will also transmit weekly charts of sea surface temperature via radio facsimile over radio station WWD on Friday at 10:00 PDT on 8644.1 kHz, beginning July 1, 1978.

Cooperative NMFS/American Fishermen's Research Foundation Albacore Fishing Studies to Continue

The NMFS and the American Fishermen's Research Foundation (AFRF) will continue to conduct cooperative albacore research studies during 1978, Dr. Michael Laurs reported. Studies include: 1) an exploratory research survey to evaluate the feasibility of jig fishing for albacore by U.S. vessels in the western Pacific (funded by the Pacific Tuna Development Foundation); 2) an extensive tagging program of the "southern" group of albacore as part of a study of the migration patterns and growth of this group of fish; and 3) a late-season exploratory/research survey in waters between southern California and Hawaii in conjunction with the tagging program of the "southern" albacore group.

COMMERCIAL & RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Data Collected for Paper on the Economic Value of California Fisheries

Economists Jane McMillian and Dan Huppert continued to collect data for a paper on the economic value of California fisheries to be presented at the July meeting of the Association of Fish and Wildlife Agencies. Much of the activity has centered on NMFS offices in Terminal Island and Washington, D.C. A great deal of data collected in raw form is aggregated nationally or by region before being published in official NMFS publications (primarily Current Fishery Statistics or Market Review and Outlook series). As a result, it is difficult to examine economic characteristics of individual states or regional fisheries without gaining access to original raw data files. This problem is confounded by serious gaps in coverage of economic variables and the seemingly haphazard statistical procedures involved in some data collection efforts. The general impression is that domestic landings and ex-vessel prices are very well documented, at least in California. Wholesale and retail information (such as product form, product yield from raw fish, production volume and sales price) are well documented for some species or fisheries, but poorly covered for others. Also, data collected from processors annually appear to be potentially seriously biased due to the use of unreliable single-try mail questionnaires. Once the paper on California fisheries is completed, SWFC

economists will devote some time to the constructive criticism of NMFS economists data. This will be especially important now that data base management systems are being designed for NMFS use.

FY 78 Socio-Economic Contract Funds

SWFC and SWR economists met at the La Jolla Laboratory on May 25 to allocate \$188 thousand potentially available for contracts. The final decision was to split the money as follows:

- (1) Hawaii and Western Pacific - \$80 thousand for study of market information in Hawaii.
- (2) Socio-cultural factors - \$30 thousand for comprehensive review and compilation of existing information including community profiles, Census Bureau data, social and anthropological studies.
- (3) Multi-species fisheries economic study - \$80 thousand for economic study on fisheries for salmon, crab, albacore, ground-fish from multi-species management perspective.

Requests for proposal will be developed by Mike Adams of the Honolulu Laboratory, Jane McMillan of La Jolla, and Wes Silverthorne of the Southwest Region, and these will be sent to NASO in Seattle for processing as soon as the Washington office gives the funds to SWFC/SWR.

Jack Mackerel Fishery Plan Presented to Pacific Fishery Management Council

Acting in place of Alec MacCall, chairman of the jack mackerel fishery plan development team, Dr. D. Huppert presented the Team's proposal and background information on mackerel to the Pacific Fishery Management Council (PMFC) and its SSC at the May 10-12 meeting in Boise, Idaho. With some minor modifications, the proposal was found acceptable. The team will prepare a first draft of a management plan for the Council's consideration in December 1978.

Anchovy Management

Svein Fougner of the Southwest Region presented an implementation schedule for the proposed Anchovy Plan at the May meeting of PFMC. The Council referred this to the Scientific and Statistical Committee (SSC) and Advisory sub-panel for review. Council approval in June will allow the Anchovy Plan to be approved by the Secretary of Commerce and fully implemented by August 1.

An annual report to the Council on the status of the anchovy fishery is one element of the implementation schedule. Stauffer, McMillan and Huppert prepared the required report and sent copies to SSC members on May 31.

Aerial Marine Resource Monitoring Data

Joe Caruso, Computer Programmer, spent the month learning Report II generator on the Infonet Computer System. Report II is a program that produces formatted reports of a user's data upon request. He has produced some trial reports of the aerial marine resource monitoring system data. The following table is an example of an inventory of 1 year's data.

AERIAL MARINE RESOURCES MONITORING SYSTEM

Effort Data Base

Quarterly Flight Summary

Year	Quarter	Time of day	Number of pilots. reporting	Number of flights	Number of blocks searched*
1967	1	Day	4	33	524
		Night	4	122	2205
	<u>1</u>		<u>4</u>	<u>155</u>	<u>2729</u>
	2	Day	4	73	1459
		Night	3	32	731
	<u>2</u>		<u>4</u>	<u>105</u>	<u>2190</u>
	3	Day	5	191	4312
		Night	2	19	365
	<u>3</u>		<u>5</u>	<u>210</u>	<u>4677</u>
	4	Day	4	71	1401
		Night	3	12	234
	<u> </u>		<u>4</u>	<u>83</u>	<u>1635</u>
			<u>5</u>	<u>553</u>	<u>11231</u>
	1967				

* Number of blocks searched is defined as the number of 10' by 10' ocean blocks over which the pilot has flown as indicated on his flight log.

Plans for Abbreviated Egg and Larva Survey in 1979 Prepared

Dr. Gary Stauffer, Fishery Biologist, has prepared plans for an abbreviated egg and larva survey for the winter and spring of 1979. The objective of the survey is to estimate anchovy spawning biomass and to measure relative abundance of hake spawning biomass. The survey is scheduled for four cruises during the 5 month-period; January-May. Arrangements are being made to have a Scripps Institution of Oceanography research

vessel conduct the January cruise and a Soviet vessel to run the February cruise (under terms of the U.S.-U.S.S.R. cooperative research agreement). The Jordan will conduct the third and fourth cruises. The second and third cruises will be coordinated with CF&G research vessel, Alaska, scheduled to conduct sea survey in February and a midwater trawl survey in late March and early April. These latter cruises will provide a test of the two alternative biomass estimation methods involving age composition data and gonad follicle data, developed at the La Jolla Laboratory.

Alternative Estimation Methods for Anchovy Biomass - BESTMIX Evaluated

Keith Parker, Statistician, and Dr. Gary Stauffer, Fishery Biologist, are evaluating three proposed methods for estimating anchovy spawning biomass based on age composition data for years following a CalCOFI survey. Parker has been investigating each method to determine how recruitment is accounted for. The methods are quite similar in that the spawning biomass for a CalCOFI year is partitioned into age groups by age composition data from either the fishery or California Fish and Game sea surveys, and each age group is multiplied by survival for that year. Then the biomass is estimated from the relationship of biomass at age and age composition in the second year. The methods differ in the algebraic formulation of this relationship. The methods are being evaluated for two groups of years, 1972-1975 and 1975-1978. At the moment, parameter estimates for growth and mortality are being re-evaluated to improve the accuracy of the estimates. An important aspect of this work will be a review of the sampling design for the sea surveys with respect to season and area coverage for estimating age composition of spawning population.

Rockfish Growth Rates Compared with Those Found by Other Investigators

For some species of rockfishes, Fishery Biologist John MacGregor has been able to compare growth rates with those found for these species by other investigators. Westrheim and Harling (1975) in the Pacific Northwest and Phillips (1964) in central California found more rapid growth rates after the first year or two than for the same species that we have aged from southern California. MacGregor is looking into the possibility that these rockfish may be forming two rings a year after the first year in southern California.

On the other hand, fish aged by Chen (1971) from southern California have slower growth rates than the same species in the present study. For example, from the same locality (off La Jolla) Chen found 10-year-old calico rockfish (Sebastes dallii) to be 130 mm standard length at age 10, while MacGregor finds calico rockfish to be 132 mm SL at age six and 156 mm at age 10. Unfortunately, none of Chen's species were taken in other age studies.

1978 CalCOFI Conference Planned

Dr. Reuben Lasker, Division Leader, reports that the 1978 CalCOFI Symposium, sponsored this year by NMFS, will be held at Idyllwild on October 31, 1978 and will be entitled, "Non-Consumable Living Resources of the California Current: Interactions with Consumable Resources and the Methods of their Exploitation." Alex MacCall, chairman of the symposium, says that about half of the speakers have made commitments to the symposium. However, speakers on the larger marine mammals (pinnipeds and cetaceans) may be difficult to obtain, due to their full schedules. A rather good program on seabirds is taking shape. The symposium should help fishery researchers and managers gain a broader perspective on the ecosystems they are charged with managing and understanding.

LARVAL FISHES, COASTAL EAST PACIFIC PROGRAM

Analysis of Reproductive State Provides Estimate of Anchovy Spawning Frequency

Dr. J. Hunter, Fishery Biologist, reports that the final histological analysis of the reproductive state of 295 female anchovy collected in the Los Angeles Bight in February by the California Department of Fish and Game has been completed. This analysis provides an estimate of the frequency of spawning of anchovy which is an essential parameter required to directly assess spawning biomass from egg and larvae survey data. The analysis involves determination of the age of post-ovulatory follicles in the ovary. In anchovy, spawning immediately follows ovulation and at ovulation a remnant of the ovulated follicle remains in the ovary. Laboratory studies here have demonstrated that these remnants or post-ovulatory follicles may be identified for about 24 hours after spawning and histological criteria were established to classify them into ages of less than 24 hours old, and 24 hours old. Post-ovulation follicles older than 24 hours are identified with less certainty because the follicle is rapidly absorbed and cannot be easily distinguished from atretic oocytes (early stages of eggs in the ovary that are undergoing absorption).

Analysis of the 24-hour old post-ovulatory follicles indicated that in February 16% of the female anchovy in the Los Angeles Bight spawned per day or all females spawned about once a week. Follicles less than 24 hours, indicating spawning on the night of capture, were not used because anchovy samples were not taken throughout the night of spawning. On the average, these structures appeared in 8% of the females collected.

Several other features of the ovary were also studied. The presence of hydrated eggs indicates imminent spawning (just before ovulation the eggs take on water and swell) and the presence of late-stage atretic follicles. Analysis of the number of fishes with hydrated eggs in the ovary as a function of time of night gave an indication of the time of

spawning. No females with hydrated eggs occurred in our collections before 1900 hours, but the numbers increased sharply thereafter and remained high (6-24% of the females) until about 2300. Females with recent post-ovulatory follicles, indicating recent spawning, occurred for the first time between 1900 and 2000 hours, but were more common later in the evening. These data suggested a 1-2 hour period may exist between hydration and ovulation. Ovulation must occur very rapidly because only two of the 295 females had both hydrated eggs and recent post-ovulatory follicles.

All females taken in February were in reproductive condition. Twelve (4%) were less than 90 mm, which is less than the minimum size at first reproduction estimated by Clark and Phillips (1952). The smallest reproductively active female was 73 mm standard length. Nine of these small females were taken in a single sample (no. 45), single females less than 90 mm were also collected at stations 8, 9 and 42 (number of females per sample = 10). All of these stations are southern and inshore, ranging from Santa Catalina Island to a few miles offshore of La Jolla. They may indicate a northern extension of the southern subpopulation which may reproduce at a smaller size.

Studies Continue of Shrinkage of Larval Fish upon Preservation

Fishery Biologist Gail Theilacker at the La Jolla Laboratory is continuing to study preservation shrinkage of larval fish. Shrinkage factors are required to relate laboratory results to field studies. Last month it was determined that 4-5 mm larvae shrink 7-8% in formalin when preserved with laboratory techniques and 20-30% when preserved by simulating "field" techniques (net treating larvae in running sea water for 10 minutes prior to preservation).

The comparison of laboratory and "field" preservation methods is now being tested (1) with older larvae (anchovy larvae have been sampled for 50 days and the largest larvae are now 20-23 mm) and (2) at several net-treatment time intervals. During standard ichthyoplankton surveys, the net is towed for 20 minutes (ascending 15 minutes), and then the collected sample is washed down into the cod end before preservation. Sea-caught larvae could probably be damaged from abrasion by the net or other plankters for up to 20 minutes before preservation. Therefore, anchovy larvae are now being measured in the laboratory after 5, 10, 15 and 20 minute net treatments. The results show that duration of mechanical damage incurred by a larva in the net treatment affects shrinkage, and smaller larvae are shrinking more quickly than larger larvae. Larvae less than 8 mm reach maximum net treatment shrinkage (20-30%) within 5 to 10 minutes; older larvae shrink throughout the 20-minute period. For example, 18-23 mm larvae are 3% smaller after 5 minutes and 9% smaller after 20 minutes in the net. Further net treatment of larger larvae causes an additional 1 to 2% shrinkage.

Jim Zweifel, Mathematician at the Southwest Fisheries Center, fitted an asymptotic curve to the 10-minute shrinkage data; the fit is very good, and indicates that at 50 mm shrinkage will be negligible (metamorphosis complete at about 35 mm). If net-treated larvae continue to fit on curve at 30 mm, sampling will probably be discontinued. Shrinkage curves will be prepared for all "field" and laboratory treatments after the preserved larvae are measured.

Microscope Study Indicates that Some Inshore Stations Have High Percentage of Starving Larvae

Dr. C. O'Connell, Fishery Biologist at the La Jolla Laboratory, reports that microscopic study of sectioned anchovy larvae specially collected in March 1977 is now well advanced, and indicates that on the average about 10% of net tow specimens were emaciated or starving. However, these "poor" larvae occurred largely in three tows (one day, two night) taken within a few miles of each other on different days and within a few miles of the coast. Most of the other 25 or so samples taken in the same region (Santa Barbara Channel) contained only robust larvae, often large quantities of them.

Subsequent study of the remaining unsectioned larvae from all samples revealed that the three samples with a high proportion of histologically poor larvae also showed a high proportion of deformed whole larvae. The nature of the deformities and histological symptoms suggest that the muscle and other tissues of these animals had poor tone because the ratio of protein to water was low and because the volume of various body fluids, plasma, endolymph, perilymph, was low.

In examining the whole larvae, two additional samples were found to have a high proportion of deformed specimens. If histological examination confirms that these are larvae in poor condition, it will suggest that approximately 15% of the inshore stations contained a high proportion of emaciated larvae. By contrast, a more or less equal number of offshore stations, outside the Channel Islands, showed few emaciated larvae, and these were widely scattered among samples with low anchovy abundance.

Properties of Parameters of Larval Fish Sampling Investigated

James Zweifel, Mathematician at the La Jolla Laboratory, is continuing his investigation of the small sample properties of the parameter estimators in the weighted negative binomial distribution. The distribution has been found to be useful for obtaining estimates of larval catch when the probability of capture is not constant. In particular, he has shown that when corrected for the probability of capture, catches at a succession of size intervals may be described by a series of negative binomial distributions whose means fall on a standard mortality curve and whose variances indicate high aggregation in small larvae decreasing to a minimum

at the onset of schooling and increasing thereafter. As with most naturally occurring sampling distributions and for non-linear models in particular, the sampling probabilities of the estimators are known only for large sample sizes. While it has been shown that the small sample properties of these asymptotic estimators often lead to intolerable or meaningless results for asymmetric distributions, no generally accepted theoretical methods for determining sampling probabilities in such situations has been advanced. Using Monte Carlo techniques, Zweifel is examining the sampling probabilities for a single distribution and for the non-linear regression model with densities and aggregation coefficients normally found in CalCOFI surveys. The latter results are requisite for the determination of sample size required for estimating the confidence limits on larval production.

SURVEY SYSTEMS DEVELOPMENT & EVALUATION PROGRAM

Spawning Biomass Estimated for Southern Subpopulation of Northern Anchovy

Maritza Escudero, Biologist from Instituto Nacional de Pesca and Dr. Paul Smith, Fishery Biologist, specified regions off the coasts of California and Baja California and requested that Computer Programmer B. Burris extract a time series for the southern subpopulation of the northern anchovy. The program had recently been written by Burris to extract the central subpopulation for use in the preparation of the Anchovy Management Plan.

The more general term, "Biomass Index" is used in the accompanying figures 1 and 2 because no formal attempt has been made to relate the absolute spawning biomass of the southern stock of northern anchovy to the regional census estimate of anchovy larva abundance. For the central stock of northern anchovy, the working assumption is the equation

$$Ba = .098 La$$

where Ba is the spawning biomass of anchovy in tons and La is the regional census estimate of anchovy larvae of all sizes in billions.

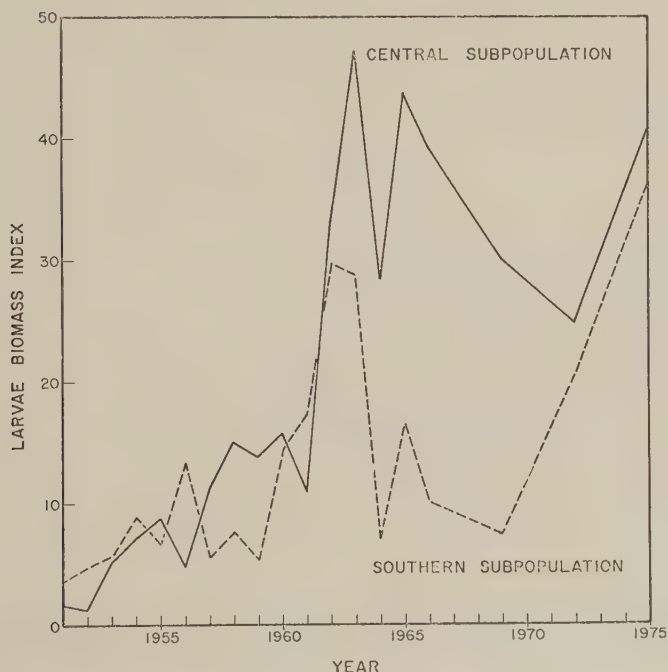
For the time series the regional census estimates subsequent to 1968 have been reduced by 50% because a new plankton net with improved retention of small larvae was introduced for the purpose of studying embryonic and early larva mortality. The standard net was changed in 1978 to capture more large larvae without altering the number of small larvae. Studies have not been conducted on the appropriate factor for converting regional census estimates of larvae to spawning biomass for the southern subpopulation.

One major difference discovered in the Escudero, Burris, Smith study reported here is that the anchovy larvae of the southern subpopulation find themselves in nearly 2° celsius warmer water on the average and thus might be undersampled by 20% owing to faster development rate and consequently lessened sampling vulnerability.

The sampling regions used for the central subpopulation total 166,277 square nautical miles and span the region from San Francisco to Punta Baja, south of Ensenada, Baja California Mexico, excluding Sebastian Viscaïno Bay. The five sampling regions used for the southern subpopulation total 90,587 square nautical miles and span the region from Sebastian Viscaïno Bay to Cape San Lazaro off the southern extremity of Baja California. By way of comparison the state of California has an area of 158,693 square statute miles or 119,832 square nautical miles.

The figure below shows the time series from 1951 to 1975. The points from 1966 to 1975 are at 3-year intervals. Year-to-year variations appear to be of the same magnitude as those in the Central subpopulation, but the overall level of the Southern larva index appears to be approximately half that of the Central subpopulation.

It now appears that the three subpopulations of the Northern anchovy have a recent spawning biomass estimate of 0.8 million metric tons for the northern subpopulation, 3.2 million metric tons for the central subpopulation, and about 1.6 million metric tons for the southern subpopulation. No extended time series exists for the northern subpopulation of the Northern anchovy.



Oceanic Fisheries Resources Division

TUNA RESOURCES PROGRAM

Scientists Participate in 29th Tuna Conference

The 29th Annual Tuna Conference was held at Lake Arrowhead, California, on May 21 through 24. The Conference was organized this year by Robert Bell of the California Department of Fish and Game. Dr. Gary Sakagawa, Leader of the Tuna Resources Program, served as moderator for one of the sessions and also as a panelist for a discussion of "Extended Jurisdiction and the Fishery Scientist." He presented a brief history of resource management in the United States and reviewed the Fishery Conservation and Management Act of 1976 as it applies to tuna and billfishes. The session generated a vigorous discussion on the "highly migratory" species concept of the Act, the role of biologists in fishery management, technical expertise of Council members, operational processes of Councils and current developments in international management of tunas, particularly in the western Pacific.

Two technical papers were presented at the Conference by members of the Tuna Resources Program. Mathematician Al Coan presented a paper entitled "An analysis of the status of yellowfin tuna (Thunnus albacares) stocks in the eastern Atlantic," which he co-authored with Fishery Biologist Norman Bartoo. The presentation covered a brief description of the fishery, and showed, with a cohort analysis, that recruitment of Age I fish has averaged about 21 million individuals a year. The most interesting finding of the study was a decrease in yield-per-recruit of 6% in 1975 from that in the 1960's, despite a minimum size regulation of 3.2 kg. A more thorough discussion of the paper was presented in the April Monthly Report.

Fishery Biologist Earl Weber presented a paper entitled "The California swordfish harpoon fishery, 1974-1977." The paper covered a brief review of the harpoon fishery and reported the results of analysis of logbook data.

Aerial Pelagic Fish Monitoring Program
Calculates Abundance Indices for 1977

The 1977 flight logs submitted by aerial fish spotter pilots operating off southern California and under contract to the NMFS/SWFC were processed and analyzed for flight effort by Fishery Biologist James Squire at the La Jolla Laboratory. Sightings data giving locations, species and estimates of tonnage in the area was tabulated. Using these data, apparent abundance indices were calculated for the northern anchovy, Pacific sardine, Pacific mackerel, jack mackerel, Pacific bonito and bluefin tuna.

This study began in 1962 when contracts were obtained with 4 to 6 aerial fish spotters that fly for the commercial purse seiner fleet operating out of San Pedro and Port Hueneme, California. Since 1962 approximately

40,000 flight hours have been recorded. The fish spotter pilots record the aircrafts search route and fish observations on special charts or flight logs furnished by the SWFC. These data are analyzed by 10 minute longitude by latitude block areas to compute diurnal and nocturnal variations in apparent abundance and an annual index of apparent abundance.

The 1977 data indicates a dramatic change in the abundance level of Pacific mackerel during the past year. From a slight increase in abundance, reflected in the 1976 index, the Pacific mackerel is presently one of the most frequently observed species being seen by the contract aerial spotters. The Pacific mackerel declined by 1964 to a very low level of abundance and remained so until 1976-1977, but now it is at an abundance level two times the highest level observed by the first year of the program (1963). In 1963 the commercial catch of Pacific mackerel totaled 20,000 tons. The reasons for the dramatic increase in abundance level is not understood. Jack mackerel abundance level was up sharply in 1977 in a similar manner as Pacific mackerel, again two times the abundance level recorded in 1976. It is now near the level observed in 1963, when it was also a declining fishery, and when the total catch was about 47,000 tons.

The northern anchovy continues to decline in abundance, down slightly (14%) from the levels observed in 1976. Present abundance levels are reduced about 2-1/4 times, or about 69% less than the peak level of abundance recorded in 1973. Anchovy levels in 1977 are slightly above the relatively stable levels of abundance observed from 1963 through 1967.

Pacific bonito abundance continues its downward trend started in 1973, a year after a season (1972) noted for warm sea surface temperatures in the eastern Pacific.

It is evident from the index and other surveys (such as sonar) that substantial increases and decreases in abundance levels have occurred in the multispecies stocks of anchovy, Pacific and jack mackerel during the past year.

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Atlantic-caught tunas transshipped to Puerto Rico have been sampled routinely for biological information by Technician Eugene Holzapfel of the La Jolla Laboratory since March 1975. Data on fork length, weight and species composition were collected.

Results of sampling during the period January through May 1978 are as follows:

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	6	245	259
	Purse Seine	3	147	84
	Unknown			
Skipjack	Baitboat	4	201	1972
	Purse Seine	1	50	529
	Unknown			
Bigeye	Baitboat	5	217	158
	Purse Seine	2	61	28
	Unknown			
Albacore	Longline			
TOTAL		21	921	3030

Tuna Vessels Participate in FAX Program

During May 1978, 19 tuna seiners contributed synoptic weather and XBT (expendable bathythermograph) data to the NMFS FAX Advisory Program. The table below shows data for the month of May 1975, 1976, 1977 and 1978 that were transmitted to NMFS-licensed radio station WWD by participating vessels.

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
Number of vessels with equipment	76	73	56	53
Number of vessels reporting	36	30	23	19
Number of weather observations reported	342	262	178	119
Number of XBT observations reported	70	21	22	13
Monthly observation total	412	283	200	132
Year-to-date total	1676	1361	670	1000

There were several vessels in port for most, or all, of the month of May 1978, accounting for the low reporting rates. We anticipate higher re-reporting rates when these vessels return to sea.

The tuna seiner Cheryl Marie leads the list of program participants this month with 11 weather observations and 12 XBT observations. The tuna seiner Santa Rosa contributed 15 weather observations although she was in port for approximately half of the month. We extend our congratulations to Captain John Silveira of the Cheryl Marie, Captain John Gomes of the Santa Rosa, and to the crews of these two vessels, and our appreciation to all contributing vessels and crew members.

MARINE MAMMAL ASSESSMENT & MONITORING PROGRAM

Center Scientists Attend Conference on Population Dynamics of Large Mammals

Drs. David Au, Rennie Holt, Joseph Powers and Tim Smith of the Marine Mammal Assessment and Monitoring Program, and Dr. William Perrin of the Marine Mammal Biology and Technology Program (all of the La Jolla Laboratory) traveled to Logan, Utah to attend the International Conference on the Population Dynamics of Large Mammals held at Utah State University, May 24-27. This conference marked the first time that scientists studying the closely related population dynamics problems of a diverse group such as bears, whales, dolphins, and elephants have come together to exchange information on allied processes. The conference was well received by scientists from throughout the world.

Dr. Smith, co-organizer of the conference, presented a paper on fur seals, and Dr. Powers chaired a session in which comparative approaches were discussed.

Independent Analysis of Estimates of Dolphin School Size Started

An independent analysis of the estimates of dolphin school size collected by NMFS personnel was begun by Copley International Corporation this month. The statistical work to be carried out by Ernest Brazier of Copley will investigate differences in the estimates among aerial, research vessel and tunaboat observers, and tuna boat crew members; seasonal, aerial and annual differences, and contributory environmental factors which might influence the estimates. The study will involve weighing of the statistical evidence and other associated information such as photographic data to produce recommendations for school size assessment, as present population estimation procedures require a mean school size in order to expand the abundance of schools estimate to abundance of individuals, according to Dr. J. Powers, Leader of the Marine Mammal Assessment and Monitoring Program at the La Jolla Laboratory.

Aerial Survey Plans Made for 1979

The Southwest Fisheries Center is attempting to gain permission and logistical support from Ecuador to use Seymour Airport in the Galapagos Islands as a temporary base from which flights may be staged during the 1979 porpoise aerial survey. A research proposal and assistance request were recently sent to several agencies of the Ecuadorian government and officials of the Charles Darwin Research Station, located on the islands. The major obstacles that must be overcome in order to fly from the Galapagos are arranging for aviation fuel to be shipped and stored at Seymour, obtaining permission to use the airstrip and over fly the islands, and arranging for overnight accommodations near the airplane.

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Further film comparisons were conducted on May 18 by NOAA Corps officers T. Jackson and W. Perryman, detailed to the La Jolla Laboratory, aboard a Coast Guard helicopter in local waters. Two schools of dolphins, one Grampus and one Delphinus, were photographed to test the water penetration ability of several types of film. This work is in preparation for an aerial survey of porpoise populations in the eastern Pacific scheduled for 1979 if funds become available.

MARINE MAMMAL BIOLOGY & TECHNOLOGY PROGRAM

Second Research Cruise of Dedicated Vessel Nearing Completion

Although hampered by poor weather much of May, NMFS scientists--J. Jennings, J. Coe, W. Stuntz, and J. Lambert, assisted by B. Walker, representative of a private contractor and C. Peters of LMR, Inc., have successfully tested the experimental porpoise impoundment system on four schools of wild dolphins in the eastern tropical Pacific. They have developed the necessary procedures for examining whole schools of spotted dolphins with very low mortality rates and will be able to collect blood samples and other biological information in future sets. The workability and limitations of the porpoise impoundment system have been established so that future dedicated vessel cruises can employ it in large scale tagging efforts beginning in August or September of this year. Cruise II is scheduled to be completed between June 5 and 10 depending on the weather.

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Meanwhile at the Center, plans and contracts were being arranged for Cruise III of the Queen Mary, scheduled to depart by the end of June. This cruise will consist of two, 30-day legs. The first leg will be concerned with the examination of alternative fishing methods including

acoustic lures under the scientific cruise leader, Dr. Frank Awbrey of San Diego State University. The second leg of Cruise III will test tuna olfactory lures developed under NMFS contracts and continue studies of comparative dolphin behavior. Throughout the cruise NMFS technicians Tom Duffy and Dave Bratten will be making measurements of the fishing gear under varying set conditions and collecting blood samples for behavior physiology studies. Cruise IV is scheduled for September 2 to October 23. The Queen Mary has been dedicated to research on the porpoise/tuna interaction problem during the calendar year, 1978, by the U.S. tuna industry.

Progress Made in Research on Porpoise Tag Design

Porpoise tags of varying designs and materials, mounted on porpoise dorsal fins, were tested under contract by Walt Gandy of the NMFS National Fisheries Engineering Laboratory at Bay St. Louis, Mississippi and Rusty White of Hubbs-Sea World Research Institute in the flow tanks at Utah State University in Logan recently. Three tag designs and three types of plastics were selected as a result of their performance under pressure in the flow tanks. The selected tags included a dorsal fin disc, a dorsal fin flag and a spaghetti type streamer. These tags, constructed of the selected materials will be placed on captive Hawaiian spinner dolphins at Sea Life Park in Hawaii early in June and the results evaluated by J. Jennings, Fishery Biologist, who is in charge of the tagging program. Radio telemetry equipment using both VHF and CB frequencies has been purchased in preparation for the dedicated vessel cruise for tagging studies.

Final Preparations Made for International Aging Conference

Fishery Biologist M. Kimura reports completion of an annotated bibliography on age determination in marine mammals which will be published in conjunction with the symposium papers that are to be presented at the International Conference on Age Determination of Odontocete Cetaceans scheduled to be held in La Jolla beginning September 5. In addition to the National Marine Fisheries Service, the conference is sponsored by the U.S. Marine Mammal Commission, International Whaling Commission, and the International Union for the Conservation of Nature.

A. Myrick, Wildlife Biologist, reports that plans and arrangements for the conference are proceeding well and that abstracts for 10 of the 26 expected papers have been received. Any inquiries concerning this conference should be directed to Myrick or to the convenor, Dr. William Perrin, at the Southwest Fisheries Center, La Jolla, California 92038.

NMFS Scientists Assists in Design of
Research Program for Dall's Porpoise

Dr. W. Perrin, Leader of the Marine Mammal Biology program at the La Jolla Laboratory, was in Japan April 25-28 assisting in the design of a research program to study incidental mortality of Dall's porpoise in the Bering Sea salmon gill net fishery. As a result of this meeting a joint research program has been arranged with NMFS and Japan to study Dall's porpoise mortality in the fishery. Research efforts will include intensification of observation efforts aboard albacore fishing boats working in the northwest and placing observers aboard U.S. and Japanese research vessels and Japanese mother ships. Initially, six NMFS regional observers, based at the NMFS office in San Diego will pair with Northwest and Alaska Fisheries Center on these vessels for training.

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A. Myrick, Wildlife Biologist, and his staff have begun calibrating the layering of dentine tissues in seven Tursiops or common dolphin, of known age. These calibrations will eventually be used to determine aging in porpoise of unknown age.

Myrick this month was host to two scientists from Hubbs-Sea World Research Institute who used his polarizing light microscope to examine teeth sections from dolphins (Delphinus delphis) that has been marked with tetracycline.

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In other developments, Dr. W. Perrin, Leader of the Marine Mammal Biology program, reported that all of the porpoise specimens which have been collected by NMFS observers aboard tuna seiners to date have been processed and the information deposited in the computer for future analysis.

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The University of Puerto Rico has been given a contract by the NMFS to collect, process and ship to the Center, all specimens of porpoise which may be off loaded in Panama.

PACIFIC ENVIRONMENTAL GROUP

OCEAN MODELING AND FORECASTING

Climate & Fisheries Workshop Held at
University of Rhode Island

The following report, "Climatic Variation and the Pacific Mackerel Fishery," is a contribution by Dr. Richard H. Parrish to the Climate and Fisheries Workshop held March 29-31, 1978 at the University of Rhode Island:

The Pacific mackerel fishery, a companion fishery to the Pacific sardine fishery, has shown a developmental pattern which is becoming all too common among fisheries for small pelagic species. In Pacific mackerel the explosive expansion of the fishery occurred in the mid-1930's and the subsequent erratic decline to near commercial extinction was completed by the late 1960's (Figure 1). A cohort analysis (1928-68), using a natural mortality rate of $M = 0.5$, shows that the maximum total biomass occurred in 1933 (438,000 MT) and that the stock was reduced to less than half of one percent of the 1933 maximum by 1968 (1500 MT).

The exploitation rate increased as the stock declined (Figure 2) and the decline was often blamed on adverse climatic or environmental conditions; which is also typical in fisheries for small pelagic fishes. If the decline was associated with a climatic change, or other long-term environmental alteration, relative reproductive success would be expected to show a downward trend. However, there was no marked downward trend in recruits-per-spawner over the 1928-1968 period. Reproductive success was markedly non-random. Runs of years with reproductive success alternate with runs of years with poor reproductive success (Figure 1). It is this combination, a series of years with below average reproductive success and an increasing exploitation rate on the dwindling spawning stock, that has finished so many stocks of small pelagic fishes.

The observed record of spawning success in Pacific mackerel suggests that runs of years with poor reproductive success are common and we must expect them to occur in the future.

Recruitment in Pacific mackerel shows little density dependence. A Ricker spawner-recruit curve accounts for only 24 percent of the variance in recruitment. Climatic and density-dependent spawner-recruit models, developed with stepwise multiple regression and non-linear regression procedures, were fitted to the data available for two time periods; 1931-68 (mostly shore based data) and 1946-68 (which included more refined data on wind-driven circulation). The 1931-68 model accounted for 59 percent of the variation in recruitment; increased recruitment was associated with reduced sea level, reduced atmospheric pressure and increased sea surface temperature during the spawning season. The 1946-68 model accounted for 76 percent of the variation in recruitment; increased recruitment was associated with increased coastal upwelling and decreased offshore convergence during the spawning season. Both models suggest that good reproductive success is closely associated with increased wind induced upwelling just prior to and during the May to July spawning season.

Yield simulations, of the Pacific mackerel stock, show that maximum sustained yield (MSY) with a steady state dynamic pool model is above 41,000 metric tons. Simulations, incorporating the climatic and density-dependent spawner-recruit functions, predict that MSY cannot be attained when there is coherence in the recruitment fluctuations. Maximum long-term yield under the environmental conditions occurring between 1931-68 was only 25,000 metric tons.

The sharp decline in the 1960's, due to a long series of years with poor reproductive success (1962-67), and an increased exploitation rate, was associated with anomalously low upwelling indices during the spawning months in the Southern California - Northern Baja California spawning grounds. During the 1970's wind induced upwelling has increased particularly in 1971, 1974 and 1976. The climatic and density dependent spawner-recruit models, therefore, predict good relative reproductive success in these years. The extremely low spawning biomass levels in 1971 coupled with the moratorium on the fishery in 1972 precluded any assessment of the 1971 reproductive success. In relation to the spawning stock size the 1974 year-class was very successful and nearly the entire biomass in 1975 and 1976 were fish from the 1974 year class. Recent estimates of the 1976 year class indicate that the relative reproductive success was very close to the record 1958 year class when there were 4.5 kilograms of recruits for each kilogram of spawners. The protection of the moratorium and the good reproductive success in 1974 and 1976 have allowed the stock to rebound and present regulations will both allow a limited fishery as the stock recovers. It is significant that the present regulation will decrease the exploitation rate when natural environmental variation produces the next set of poor reproductive years.



Figure 1 - Relative spawning success (the natural log of recruit biomass per spawning biomass) and season catches from the 1928-1968 Pacific mackerel stock.

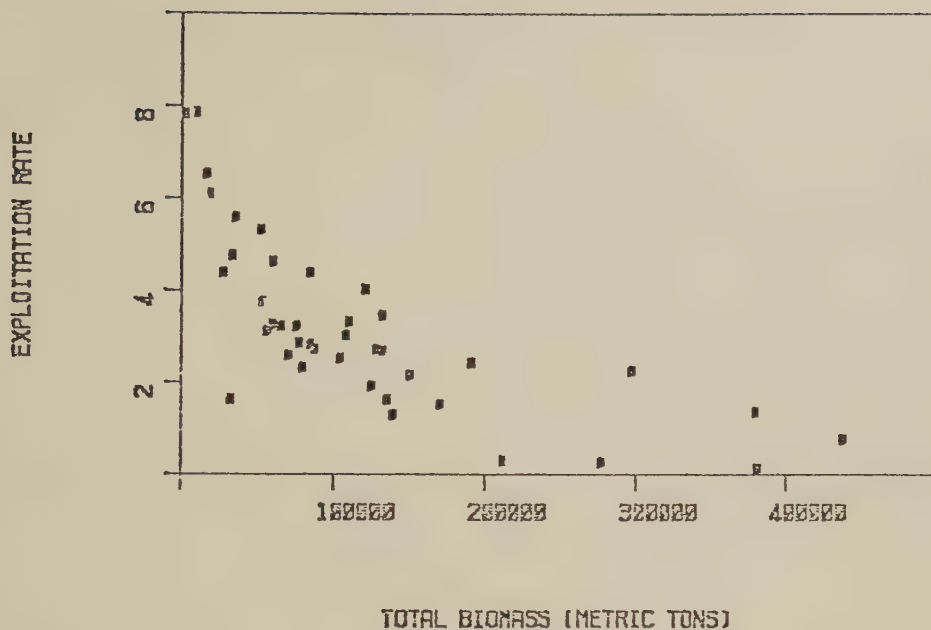


Figure 2 - The relationship between the Pacific mackerel total biomass and its exploitation rate 1928-67

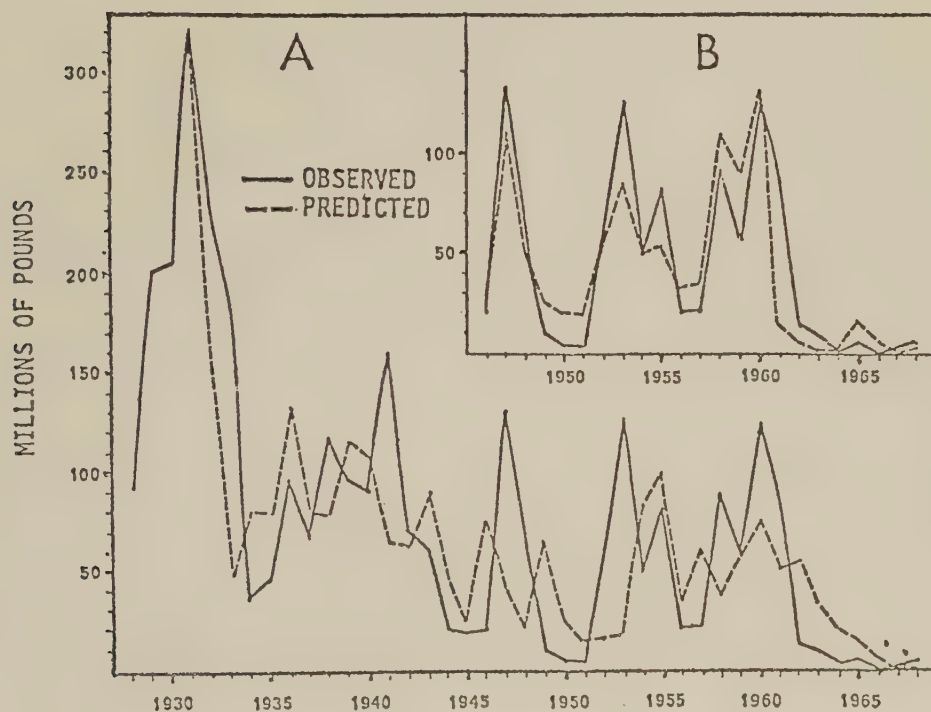


Figure 3 - Observed and predicted recruitment of Pacific mackerel.
A - Ricker sea level model B - Ricker transport model

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Upwelling Influences Changes in Marine
Environment at Albion State Site

Dr. Edmund Hobson, Leader of the Fish Communities Investigation at the Tiburon Laboratory, reported that he and Tony Chess visited their Albion study site on May 10 and found that upwelling had begun, as evidenced by a 4°C drop in water temperature. The oceanic zooplankters so numerous 10 days earlier were relatively absent and the distribution and behavior of the blue rockfish in the recently upwelled greatly changed. The thousands of juveniles (60-150 mm) so numerous in the area 10 days earlier were absent. The adults (greater than 200 mm) were there in numbers comparable to the previous visit, but behaved differently. Those in waters deeper than 15 meters were in inactive schools within 3 meters of the bottom. Fish found in shallower water were in groups of two to three and near rocks. No feeding was observed, and guts from fish (235-310 mm standard length) were empty or contained only a few fragments (algae or scyphozoans). Ten days earlier, before upwelling occurred, guts of all specimens were packed with zooplankters.

Observations made on May 19 after a week of strong west and northwest winds showed an increase in surface temperature of 1.5°C and the re-occurrence of certain oceanic plankters, both features indicating at least a partial breakdown of the previous week's upwelling episode. The analysis of two plankton tows indicated stratification of the zooplankton. The surface water was transparent and contained salps and velella (which were absent nine days earlier) in the subsurface water (greater than 1-2 meters). However, dense concentrations of calanoid copepods of at least six species occurred along with scyphozoans and hydromedusae. The calanoids caused high turbidities which precluded accurate fish assessments inshore.

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Ed Ueber, Economist at the Tiburon Laboratory, prepared the first draft of a paper on fillet recoveries of Dover sole (Microstomas pacificus). The recovery rates for Dover sole caught at depths less than 250 fathoms were found to be significantly related to fish length. Maximum recovery occurred for 43 cm fish. The decrease in recovery for fish greater than 34 cm was unexpected, but verified. The recovery rate for Dover sole captured from depths greater than 250 fathoms was not significantly related to fish length.

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Kathy Fourre, Biological Aid, prepared a manuscript describing attempts to age rosy rockfish, (Sebastes rosaceus), a member of the difficult-to-age subgenus Sebastomas. Otoliths from this species are very difficult to interpret, as there appear to be many false annuli. Consequently, scales were used for the study. Large numbers of scales (40+) must be taken from a fish for aging, because many are regenerated. Even the non-regenerated scales are very difficult to interpret. Of 85 fish sampled, all scales from seven fish were regenerated, scales from 16 fish were considered easy enough to interpret to assign a year class and make back calculations of length at age, and it was considered possible to assign year class to an additional 20 fish. Annuli on the easy-to-interpret scales appear as groups of several rings. Other hard parts, such as fin spines and vertebrae, are being examined for annuli. Also, more material is being collected in an attempt to verify the aging techniques. While it may be possible to determine growth curves for rosy rockfish and other members of the subgenus, the difficulties in aging may preclude aging of landings on a routine basis.

FISHERIES DEVELOPMENT INVESTIGATION

Local Fisheries Development

Tests conducted in San Francisco Bay showed that the Tiburon Laboratory's Furuno telemetric net recorded was operating properly. The recorder was again placed aboard the commercial trawler Cape Windy, but experimental midwater trawling for rockfish was not possible due to rough weather, according to S. Kato, Investigation Leader.

Laboratory Plans Holding Experiments with Young Eels

Holding experiments will be conducted here with elvers (young eels) from the east coast to determine if they can be held for three months in good condition without substantial growth or change in body form. If this can be accomplished, elvers captured too late for the normal growing season in Japan can be sold to that country for a tidy sum in the fall. Some elvers from mainland China recently were sold for \$470 per pound.

Disease Kills Captive Young King Salmon at Tiburon

Roger Green reported that an outbreak of IHN disease and secondary bacterial infections killed 44,000 of the 53,000 king salmon being held in net pen culture at Tiburon Laboratory. The San Francisco Tyee Club arranged with the California Department of Fish and Game to supply an additional 50,000 nose-tagged king salmon next month.

Dan Ralph traveled to Steelhammer Salmon Farms at Rochester, Washington, where 50,000 coho salmon fingerlings are being grown for us for delivery next month. Ralph installed a drip system for imprinting the young salmon and oversaw their inoculations against vibriosis.

Nine tag returns from the king salmon reared here in 1976 were received this month. All were caught in coastal waters adjacent to San Francisco Bay except for one fish that was caught off the mouth of the Columbia River.

PHYSIOLOGY INVESTIGATION

Experiments Continue to Determine Relative Contribution of Food and Feeding Factors to Survival of Striped Bass

Dr. J. Whipple, Investigation Task Leader, reported that one larval striped bass experiment was successfully completed and another begun during May. These experiments are designed to determine the relative contribution that factors associated with food and feeding have on survival and development of striped bass larvae from hatching to metamorphosis.

Preliminary results further demonstrated what was found in previous experiments--that striped bass vary widely in the viability and responses of their offspring. Larvae in the first experiment of this season survived at rates higher than last year's fish when exposed to identical conditions and food concentrations. Starved and fed larvae survived at levels above 90% until approximately 21 days after fertilization. Mortalities increased from that time on at rates inversely related to food concentration. Fed larvae ranged from 22% in 0.1 food organisms/ml to 90% mortality at 5.0/ml. As in other experiments starved larvae lived until Day 29.

Striped bass larvae differed considerably from other fish larvae in their ability to feed after periods of starvation--commonly referred to as the point-of-no-return. From the literature other fishes have a point in their development beyond which they are incapable of ingesting sufficient food to survive. Above 80% of striped bass larvae, starved for 10, 14 and 19 days, then introduced to food, survived to metamorphosis. Starved for 22 and 26 days they survived at 60% and 33%. And when given food on Day 28, one day before total mortality, all surviving larvae were able to initiate feeding and survive.

Also studied were the effects of the opposite situation where larvae begin feeding and are then deprived of food until death. Larvae starved from Days 10 and 19 did not survive any longer than larvae which had been starved the entire time, i.e. 29 days. Older larvae, starved from Day 26, lasted until Day 40.

Studies on digestion rates of larvae showed that larvae digest Artemia in shorter times with increasing age and decreasing prey concentrations. Larvae 9 days after fertilization digested Artemia between 3.5 to 5.5 hours, the shorter time occurring in the low food density. By days 20 and 28 digestion times had decreased to 2.0 to 2.5 hours.

Whipple and Nancy Stapp, Biological Aid, completed field samples and autopsies of striped bass during their spawning migration. To date a sample of 72 adults from the Delta has been taken. Sampling of post-spawning adults will be taken weekly at the Tiburon Laboratory dock.

PUBLIC AFFAIRS

- May 4 - Professor James Bollinmo Saddleback College visited the SWF Center with members of his oceanography class. Dr. Gary Stauffer was their lecturer, discussing extended jurisdiction, formulation of new management plans, etc.
- 9 - Lester Knapp and students from Palomar College visited the SWFC. Mr. Knapp has been bringing his class to the Center for a number of years since he has a particular interest in larval fish biology. Betsy Stevens presented a talk to the group and later led them on a tour of the Center's facilities.
- 10 - Dr. Eric Barham spoke to about 40 Navy Reserve Officers class on the porpoise problem. The meeting was sponsored by Dr. Robert Dean, Curriculum Coordinator for Science and Health for the San Diego County Department of Education.
- 11-12 - Lt. Dale Bretschneider, NOAA Officer assigned to PEG, traveled to Humboldt State University, Eureka, CA to give a talk on "Oceanography in NOAA" to faculty and students.
- 15-16 - Dr. Richard H. Parrish, PEG, traveled to El Segundo, CA to give a talk on "Larval Transport in the California Region."
- 18 - Roger Green, Fishery Biologist at the Tiburon Laboratory, gave a talk on net pen culture of salmon to the "Sixty Plus" Club of San Francisco State University.

HONORS AND AWARDS

- May 10 - Mr. R. Shomura, Director of the Honolulu Laboratory, attended the Federal Executive Board's luncheon in Honolulu honoring among other federal employees, Drs. Andrew Dizon and Roy Mendelssohn of Honolulu Laboratory, as nominees for Federal Manager and Federal Employee of the year awards, respectively.

SEMINARS

La Jolla Laboratory

- May 1 - Dr. R. Michael Laurs, "Recent findings on North Pacific albacore migration and stock structure.
- 15 - Richard D. Methot, Jr., Scripps Institution of Oceanography, "Growth of anchovy larvae in the sea."
- 30 - Bob Lapsley, Computer Sciences Corporation, San Diego, "Report writer capabilities on the INFONET system."

Tiburon Laboratory

- May 5 - Ed Ueber, Economist at the Tiburon Laboratory, gave a talk on "Basic Economic Theory and How it Pertains to Natural Resource Exploration (i.e. The Fishery)."

MEETINGS AND TRAVEL

- May 1-5 - B. Remington, Executive Officer for the Center, in Harper's Ferry, West Virginia to attend a NOAA Administrative Officer's Conference.
- 2 - Norman Abramson, Director of the Tiburon Laboratory, attended the Deed Transfer Ceremony at Tiburon to mark the transfer by the Department of Health, Education and Welfare of the 35 acres, declared excess by the Tiburon Laboratory to San Francisco State University.
- Dr. P. Smith, La Jolla Laboratory, was an expert witness on the status of the anchovy population before the State Assembly considering the Mello Bill which would have placed a 3-year moratorium on the anchovy fishery. The Mello Bill has now been referred back to Committee and its prospects for passage appear dim.
- Planning Officer D. Mackett met with G. Smith of the Southwest Region to discuss the Regional enforcement systems, Fishing Information Systems, and porpoise data systems.
- 3-5 - Director Barrett and Deputy Director Carr traveled to Warner Springs, California to attend the Regional Management Meeting.

- May 3-8 - R. Nishimoto, Fishery Biologist with the Albacore Fisheries program, traveled to Honolulu to install equipment on albacore vessels chartered by the Pacific Tuna Development Foundation for studies in the western Pacific and to provide suitable training for the captain and crew.
- 4 - Dr. D. Huppert, La Jolla Laboratory, to Long Beach for meeting of Pacific Squid Management Plan team and advisory subpanel.
- Jane McMillan to Terminal Island to meet with Statistics and Market News Branch.
- 5 - D. Mackett at the Tiburon Laboratory to discuss Center budget plans.
- 7-10 - D. Mackett in Honolulu to confer with Laboratory Director Shomura on tuna programs, program review and evaluation process and the Laboratory's long range goals and objectives.
- 8 - Richard Shomura, Director of the Honolulu Laboratory, returned from a trip to Fiji, Solomons, Papua New Guinea, Australia, New Zealand, Tonga, and Western Samoa. He served as a member of a three-man fisheries team, together with Messrs. M. Busby and D. Coleson of the State Department, presenting U.S. views and position regarding participation in a proposed South Pacific Fisheries Agency and explaining U.S. laws regarding tunas to the South Pacific Island government officials. Tamio Otsu was Acting Director during Shomura's absence.
- 8-12 - Dr. R. Lasker in Washington, D.C. to attend a meeting of the Task Force on Technical Goals and Objectives for implementing Section 202, Title II, of the Marine Protection Research and Sanctuaries Act P.L. 92-532, and later to New York to visit the New York Aquarium at the Osborne Laboratory.
- 9-11 - Barrett traveled to Boise, Idaho to attend the Pacific Council's Scientific and Statistical Committee meeting.
- 10 - Shomura attended a meeting of senior officials from the Department of Commerce agencies to talk about Commerce-related items at the National Weather Service conference room, Federal Building, called by Dr. Allen C. Haile, San Francisco Regional Representative to the Secretary of Commerce.
- 11 - Data Systems Manager F. Kellenberger was in Terminal Island to attend an Enforcement meeting with SW Region and California Fish and Game personnel.

May 10-12 - Dr. W. Lenarz and E. Ueber, Tiburon Laboratory, participated in a meeting of the Groundfish Management Plan Development Team at the Tiburon Laboratory.

- Dr. D. Huppert, Leader of the Commercial and Recreational Fisheries Research for Management program at the La Jolla Laboratory, attended the Pacific Fisheries Management Council meeting in Boise, Idaho.

- Dr. G. Sakagawa, Leader of the Tuna Resources program also attended the Scientific and Statistical Committee meeting and the Council meeting as representative of the billfish fishery management plan team.

12 - Dr. Y. Hokama, John A. Burns School of Medicine, University of Hawaii, met with Messrs. Shomura, Otsu, and Uchida regarding ciguatoxin studies.

15 - A CalCOFI Committee meeting was held at the Center. Following this a Genad Workshop was held on possible use of follicle identification together with egg and larva survey to determine estimates of biomass.

- Shomura met with State Senator Wadsworth Yee, Chairman, Western Pacific Regional Fishery Management Council, to make arrangements for a meeting to discuss Honolulu Laboratory's tuna aggregation and burnt tuna projects with State legislators and State, Federal and industry officials.

15-18 - Dr. D. Huppert traveled to Lake Wilderness, Washington to participate in a National Workshop on Limited Entry in Fisheries sponsored by NMFS and the University of Washington.

May 15-
June 1

- Dr. Edmund Hobson, Tiburon Laboratory, traveled to southeastern Alaska to collect data on community structures of fishes in the nearshore habitats that permit comparisons with structures of communities in warm temperate southern California and tropical Hawaiian communities.

16 - Shomura and Doyle Gates met with Hideto Kono, Director, Hawaii State Department of Planning and Economic Development; they discussed the proposed fishery base at Midway and also the South Pacific Fisheries Agency.

16-18 - Director Barrett participated in a review of the University of California, San Diego's review of their Sea Grant activities as a member of the site team.

- May 16-19 - Dr. Laurs, La Jolla Laboratory, traveled to Durham, North Carolina and Washington, D.C. to discuss results of the physiology studies on albacore and to attend a meeting on a data acquisition system for the NOAA research vessel, David Starr Jordan.
- 17-18 - Dr. W. Fox traveled to Washington, D.C. to participate in an Interagency meeting on the marine mammal bilateral agreement with Mexico.
- 17 - D. Mackett, Center Planning Officer, accompanied by Drs. G. Moser and G. Stauffer, traveled to San Francisco to attend a State/Federal Rockfish Planning meeting. Also attending were Tiburon Laboratory Director N. Abramson and Economist E. Ueber.
- 18 - The next day, Mackett went on to Menlo Park to meet with California Fish and Game personnel for further discussions on this subject.
- The meeting to discuss Honolulu Laboratory's aggregation device and burnt tuna projects was held at the State Capitol. In addition to Shomura, other participants from Honolulu Laboratory included Otsu, Yuen, and Matsumoto, Dizon, and Cramer.
- 19-24 - Shomura attended the 11th meeting of the Western Pacific Regional Fishery Management Council at Pago Pago, American Samoa. He noted that the billfish Preliminary Management Plan (PMP) came under considerable discussion.
- 20 - D. Roll, Computer Systems Analyst, was accompanied by Programmer R. Butler as they attended the Spring Systems Seminar at the University of Southern California.
- 21-23 - Following his involvement in the UC-Sea Grant Site visit, Barrett continued on to Los Angeles to serve in a similar capacity during the USC Sea Grant site visit.
- 21-24 - The 29th Annual Tuna Conference was held at Lake Arrowhead, California. Attending from the Honolulu Laboratory were: Drs. Adams, Skillman and Mr. Riggs. From the La Jolla Laboratory the attendees were: Drs. M. Laurs, G. Sakagawa and Messrs. A. Coan, E. Weber, R. Rinaldo. The Director's Report on Tuna and Tuna-Related Activities at the Southwest Fisheries Center for the six-month period, October 1977 to March 31, 1978 was distributed to participants at the Conference. Next year's Tuna Conference will be sponsored by the NMFS. Named as co-chairmen were Drs. Skillman and Sakagawa.

- May 22 - Data Systems Manager F. Kellenberger was in Tiburon, California to meet with Tiburon Laboratory personnel on data processing activities.
- E. Ueber of the Tiburon Laboratory to Portland for a meeting of the Pacific Fisheries Management Council.
- 22-27 - Dr. W. Perrin, Leader of the Marine Mammal Biology and Technology program, was in Seattle to attend a meeting of the U.S. Steering and Planning Committee for the forthcoming June meeting of the U.S.-U.S.S.R. Marine Mammal project in Siberia.
- 23 - NOAA Corps Officer W. Perryman and R. Butler traveled to Mesa, Arizona to visit Telonics, Inc. to check out a radio transmitter for possible use in porpoise research.
- Mackett in Terminal Island to meet with M. Hochman, Staff Attorney for the Region and Dick Heimann of CF&G to draft a State/Federal agreement for exchange of data, statistics and information between the State and Federal governments.
- 24-25 - E. Ueber, Tiburon Laboratory, traveled to La Jolla to attend a meeting of economists at the Southwest Fisheries Center.
- 24-30 - At the request of the State Department, Dr. Fox accompanied Ambassador John Negroponte to Costa Rica to participate in bilateral discussions on tuna fishing.
- May 30-
June 1 - Top Center Management, led by I. Barrett, Director of the Southwest Fisheries Center, met at the Royal Inn in La Jolla. Principal activity at this meeting was on laying out of a tentative program for emphasis for FY 1981.
- May 30-
June 2 - Abramson, Tiburon Laboratory, traveled to Newport, Oregon for a meeting of the Pink Shrimp Management Plan Development Team.

VISITORS

Honolulu Laboratory

- May 2 - Richard James, Solomon Islands.
- John C. Marr, ICLARM, Manila, Philippines.
- 8 - David Mackett, SWFC, La Jolla, California.

- May 10 - Dr. Wesley W. Parks, LMR, San Diego, California.
- Barbara Dwight, former Honolulu Laboratory employee.
- 12&25 - Bernie Fink, Van Camp, California.
- 15 - Mark Rice and other staff members of SEACO visited Honolulu Laboratory again to present additional literature to Shomura and Otsu.

La Jolla Laboratory

- May 1 - Paul Sund, NMFS, PEG, Monterey, California.
- 2 - Dan Ebbetts, Eddie Clavier, Greenpeace Foundation, San Francisco, California.
- 3 - Philip Oshida, Southern California Coastal Water Research project, El Segundo, California.
- 8 - Mort Miller, Economist, NMFS, Washington, D.C. here to consult with Dr. D. King and industry people on a study of the tuna vessel transfer problem and possible economic impact.
- 15 - Myra Wells, NOAA, Washington, D.C. here as part of a group examining the pension plan for the Inter-American Tropical Tuna Commission.
- 19 - Dr. Naida M. Yolen, Program Director, Grants Management, National Sea Grant program, Washington, D.C.
- 24 - John P. Wise, NMFS, Washington, D.C.
- 25 - Andrew M. Vrooman, NMFS, Washington, D.C.

Pacific Environmental Group

- May 1 - Mr. Tony Chess, NOAA, Tiburon Laboratory, Tiburon, California.
- Mr. Ted Hobson, NOAA, Tiburon Laboratory, Tiburon, California.
- 10 - Dr. Peter Black, National Hurricane Center, Miami, Florida.
- 18 - Mr. Jim Waldvogel, Sea Grant Marine Advisory Program, Watsonville, California.
- 18-19 - Dr. Robert Skillman, SWFC, Honolulu Laboratory, Honolulu, Hawaii.

Tiburon Laboratory

- May 4 - Aurora Belarmino, University of California, Santa Cruz,
Santa Cruz, California.
- 5 - Dave Mackett, SWFC, La Jolla, California.
- 8 - Robert Huffer, Scripps Inst. Oceanography, La Jolla, California.
- Ralph Larson, University of California, Berkeley, California.
- 9 - L.C. Norgaard, Sausalito Marineways, Sausalito, California.
- Dean Andrews, Sausalito Marineways, Sausalito, California.
- 10 - Bob Demory, Oregon Department of Fish & Wildlife, Newport,
Oregon.
- 22 - Fred Kellenberger, SWFC, La Jolla.

PERSONNEL

- April 9 - Tom Yocom, Fishery Biologist - Transfer to SW Region's
Environmental Assessment Branch - Tiburon Laboratory.
- May 1 - Nancy Stapp, Biological Aid - Temporary Appointment -
Tiburon Laboratory.
- Patrick J. Rutten, Ltjg. - Assignment to Tiburon Laboratory.
- 7 - Tod Foster, Biological Technician - Transfer to La Jolla
Laboratory.
- Thomas Duffy, Biological Technician - WAE Appointment -
La Jolla Laboratory.
- James Lambert, Biological Technician - WAE Appointment -
La Jolla Laboratory.
- David Bratten, Biological Technician - WAE Appointment -
La Jolla Laboratory.
- Darrell Lee, Biological Technician - Transfer to La Jolla
Laboratory.
- Gene Anderson, Biological Technician - Transfer to La Jolla
Laboratory.
- Michael Deerman, Biological Technician, Reassignment to
La Jolla Laboratory.

- May 7 - Alice-May Drury, Secretary - Reassignment to Honolulu Laboratory (from National Weather Service) - Honolulu Laboratory.
- Stephen V.D. Ralston, Biological Technician (Fisheries) - Temporary Appointment - Honolulu Laboratory.
- Donna H. Welch, Secretary - Reassignment to National Weather Service - Honolulu Weather.
- 8 - Noelle Beerman, Statistical Assistant - Student Appointment to La Jolla Laboratory.
- LeRoy Carver, Student Assistant - Student Appointment to La Jolla Laboratory.
- 9 - Sharon Hendrix and Salvador Castro, NOAA Junior Fellows, began work at the Center. Hendrix is completing her 3rd year and Castro his 1st year with the program - La Jolla Laboratory.
- 10 - Candis Cooperrider, Biological Aid - Temporary Appointment - Tiburon Laboratory.
- Tim Smith, Fishery Biologist - Career-Conditional Appointment - La Jolla Laboratory.
- 12 - Janet Sticht, Computer Programmer, Resignation - La Jolla Laboratory.
- 21 - Joseph Caruso, Mathematical Technician - Conversion to Full-Time-Permanent - La Jolla Laboratory.
- Stanley Moore, Computer Technician - Conversion to Career-Conditional-Part-Time - La Jolla Laboratory.
- James C. Cooper, Biological Technician (Fisheries) - Conversion to 130-day field assistant - Honolulu Laboratory.
- Martina K.K. Queeneth, Biological Technician (Fisheries) - Conversion to TAPER appointment - Honolulu Laboratory.
- 26 - Richard W. Kisthard, Economist - Termination of Temporary Appointment - Honolulu Laboratory.
- 30 - Dale Felbaum, Biological Technician - Transfer to La Jolla Laboratory.
- Linda L. Hudgins, Economist - Temporary Appointment - Honolulu Laboratory.

- May 30 - Barbara A. Jacques, Data Transcriber - Temporary Appointment - Honolulu Laboratory.
- Charles Hoiem, Computer Technician - Career-Condition, Part-Time - La Jolla Laboratory.
- 31 - David Ross Smart, Biological Aid - Termination - Tiburon Laboratory.
- Meryl Cohen, Biological Aid - Termination - Tiburon Laboratory.

MISCELLANEOUS

Honolulu Laboratory Library Joins NOAA-Wide Information Network

NOAA plans call for all field libraries to be on the NOAA-wide information retrieval network by 1980. However, Mrs. Hazel Nishimura, Librarian, reported that the Honolulu Laboratory has already received notification of becoming a subscriber to SDC's ORBIT system on May 18 and to Lockheed's DIALOG system on May 29, events that happened much sooner than anticipated, thanks to the efforts of Nelson Ross and Dave Mackett, SWFC, La Jolla. Now that Honolulu Laboratory's library is "on line" in the network, it will be possible to quickly query all NOAA field libraries for information needs of the Honolulu Laboratory staff. Mrs. Nishimura has already received training to use the DIALOG system; however, ORBIT searching will have to wait until she completes a training session in the system.

Transfer to Tiburon Laboratory's Excess Property to San Francisco State University

On May 3, the deed to 35 acres of excess property and several buildings was turned over to San Francisco State University. NOAA and the National Marine Fisheries Service thus relinquished the major portion of their real estate at this site. The property had become the Laboratory's housekeeping responsibility after closure of the former Marine Mineral Technology Center and was excess to the needs of the Laboratory. Michael Murray, Regional Director for the Department of Health, Education and Welfare, made the formal presentation at ceremonies attended by representatives of the Federal Government and the California State University system. San Francisco State has established the Tiburon Center for Environmental Studies on the site; this institution will primarily address estuarine problems with special emphasis on San Francisco Bay and the Sacramento-San Joaquin Delta. Two prominent ichthyologists and an invertebrate zoologist have already occupied space at the Center.

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